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EXAMINER	
SONG, MATTHEW J	

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 01/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Offic Action Summary	Application N .	Applicant(s)	
	10/653,035	CHAMBERS, SCOTT A.	
	Examiner	Art Unit	
	Matthew J Song	1765	

-- The MAILING DATE of this communication appears on the cover sh et with th correspondence address --

Peri d f r Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *17,18 and 20-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *17,18 and 20-22* is/are allowed.

6)☒ Claim(s) *23-25,27,29-32 and 34-36* is/are rejected.

7)☒ Claim(s) *26,28 and 33* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Pri rity under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/1/2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 23-25, 29-32, 34 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over McKee et al. (US 5,450,812) in view of Takada et al (US 5,362,711) and Bloeman et al (US 5,695,863).

McKee et al discloses a substrate layer **22** of MgO, a MBE equipment which includes a chamber **32** within which a substrate is placed, a plurality of canisters **34**, **36**, and **38** provided within the base of the chamber **32** for providing a vapor source of metal desired to be added to the substrate surface, where an opening is provided in the top of each canister and a shutter is associated with the canister for movement between a closed condition at which the interior of the canister is closed and thereby isolated from the MgO surface (col 3, ln 10-67 and col 4, ln 1-10). McKee also discloses a oxygen source **40** is connected to the chamber so that by opening and closing a valve, oxygen can be delivered or shut off from the chamber and the opening and closing of each canister shutter and oxygen source valve is accurately controlled by a computer controller (col 4, ln 10-18). McKee et al also discloses a growth of TiO_2 onto the MgO surface, where the pressure of the chamber is lowered to between $2\text{-}5x10^{-7}$ torr and the desired layer of TiO_2 is built upon the MgO surface by MBE techniques, where the substrate is exposed to Ti

vapor and oxygen in controlled amounts so that TiO_2 forms on the surface at ordered sites upon the MgO surface and careful control of the MBE operation is maintained to ensure that no more than one layer of TiO_2 is deposited, this reads on applicant's limitation of terminating the supply of oxygen and metal fluxes once the desired thickness is obtained (col 4, ln 35-67). McKee et al also teaches layers of TiO_2 and metal oxide are formed in an alternating fashion until at least about twenty-five cell units of the desired perovskite are grown upon the MgO surface and the surface defined by the twenty-fifth cell unit is ordered and free of strain, this reads on applicant's limitation of metal oxides occupying thermodynamically stable positions (col 5, ln 30-38). McKee et al also discloses after the strain free surface of perovskite is formed steps can then be taken to grow an additional layer of the perovskite upon the build up cell unit, the strain-free surface reads on applicant's buffer layer (col 5, ln 39-61). McKee et al also discloses barium and oxygen titanium were deposited onto a MgO substrate at a substrate temperature of 500°C and oxygen pressures of 10^{-7} torr, this reads on applicant's heating substrate to a suitable growth temperature (col 7, ln 45-55). McKee et al also discloses a similarity between pervoskite and spinel crystal forms, where the similarity in crystal forms allows the growth of a spinel upon a surface provided by a oxide constituent of a spinel in accordance to the present invention (col 8, ln 1-67 and col 9, ln 1-37).

McKee et al is silent to the oxygen supplied to the chamber is activated oxygen.

In a method of producing a single crystal film, Takada et al. teaches metals Y, Ba and Cu are evaporated from independent evaporation sources and a high-frequency coil was placed between the substrate and evaporation sources so as to generate oxygen plasma, which activated the evaporated metals and accelerated the reactions on the substrate (col 8, ln 1-15). It would

have been obvious to a person of ordinary skill in the art at the time of the invention to modify McKee et al with Takada's oxygen plasma because the plasma accelerates the reactions reducing process time.

The combination of McKee et al and Takada et al is silent to cooling the metal oxide to room temperature. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of McKee et al and Takada et al by cooling the metal oxide to room temperature after growth because it reduces operating cost since the metal oxide only needs to be at an elevated temperature during deposition.

The combination of McKee et al and Takada et al teaches a method of making a spinel structured metal oxide on a substate by molecular beam epitaxy, wherein metal atoms occupy thermodynamically stable lattice positions, as set forth previously.

The combination of McKee et al and Takada et al teaches a growth temperature of 500 and an oxygen pressure of 10^{-7} torr. The combination of McKee et al and Takada et al does not teach a growth temperature between 150-350°C and a pressure of oxygen between $1x10^{-5}$ to $1x10^{-3}$ torr.

Bloeman et al discloses a method of forming a magnetic recording medium comprising a first layer **8** of CoO and a second layer **10** of Fe_3O_4, which has a spinel crystal structure (col 4, ln 39). Bloeman et al also discloses the deposition of the second layer **10** was conducted in a Molecular Beam Epitaxy chamber by means of reactive evaporation from targets of Fe and the temperature of a MgO substrate during layer growth was maintained at approximately 302°C and oxygen gas was admitted to the MBE chamber up to a pressure of approximately $2x10^{-5}$ Torr and cooling the substrate after deposition (col 6, ln 20-67). In an alternative embodiment, Bloeman et

al discloses the second layer **10** was $Co_xFe_{3-x}O_4$ and this layer was deposited by simultaneous evaporation from separate Fe and Co sources (col 7, ln 1-20). Bloeman et al also discloses the second layer material can comprises a wide range of magnetic materials, which includes iron oxides, spinel ferrites, garnets and perovskites (col 3, ln 20-26).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of McKee et al and Takada et al with the growth conditions as taught by Bloeman et al because the reduced temperature reduces operating costs and to form a $Co_xFe_{3-x}O_4$, which is useful as a magnetic recording medium.

The combination of McKee et al, Takada et al and Bloeman et al is silent to reducing the oxygen pressure to less than $1x10^{-7}$ torr prior to cooling. Bloeman et al teaches oxidation alters magnetic properties (col 2, ln 10-20). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of McKee et al, Takada et al and Bloeman et al by reducing the oxygen pressure to less than $1x10^{-7}$ torr, as taught by McKee et a, to reduce oxidation of the film and the altering of the magnetic properties.

Referring to claim 23, the combination of McKee et al, Takada et al and Bloeman et al is silent to the cobalt is in a substantially thermodynamically stable state absent post growth annealing. The combination of McKee et al, Takada et al and Bloeman et al does teaches a low growth temperature and slow growth rate, as applicant; therefore the cobalt ferrite film epitaxially grows with the cobalt in a substantially thermodynamically stable state absent post-growth annealing because applicant teaches the Co atoms are in a thermodynamically state because of the low growth temperature and slow growth rate, note page 9 of the instant specification. Cobalt ferrite also inherently has a inverse spinel structure.

Referring to claim 25, the combination of Bloeman et al, McKee et al, and Takada et al teaches a growth temperature of 302°C. Overlapping ranges are held to be obvious (MPEP 2144.05).

3. Claims 27 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over McKee et al. (US 5,450,812) in view of Takada et al (US 5,362,711) and Bloeman et al (US 5,695,863) as applied to claims 23-25, 29-32, 34 and 36 above, and further in view of Lu et al (American Vacuum Society May/June 1995).

The combination of McKee et al, Takada et al and Bloeman et al teaches all of the limitations of claim 3, except the metal fluxes are controlled using an atomic absorption spectroscopy detection system.

In an improved method of monitoring deposition rate, Lu et al teaches an atomic absorption monitor capable of measuring atomic absorption independent of changes in optical system transmission, thus allowing the concentration of atoms in the vapor flux to be unambiguously determined in real time (Abstract). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of McKee et al, Takada et al and Bloeman et al with atomic absorption spectroscopy as taught by Lu et al because conventional deposition rate monitors require the physical presence of the monitor in the deposition chamber and the accuracy of deposition rate measurements are often comprised in MBE systems and atomic absorption spectroscopy is capable of monitoring non-intrusively (col 2).

Allowable Subject Matter

4. Claims 17, 18, 20-22 are allowed.

5. Claims 26, 28 and 33 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. The following is an examiner's statement of reasons for allowance: The closest prior art of record Bloeman et al (US 5,695,863), McKee et al (US 5,450,812) and Takada et al (US 5,362,711) teaches the deposition of a Cobalt ferrite by Molecular beam epitaxy using activated oxygen to form an ordered and strain free layer, similar to applicant's claimed method of individually controlling the fluxes of metal atoms. Hu et al ("Structural Tuning of the Magnetic Behavior") teaches depositing a cobalt ferrite by pulsed laser deposition where the Cobalt ions occupy 22.57% of the tetrahedral sites and annealing the film to have $\pm$ 2% of all the Co ions in the octahedral sites. The closest prior art does not teach or suggest at least 90% of the cobalt atoms occupy octahedral lattice positions of the Co ferrite.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matthew J Song
Examiner
Art Unit 1765

MJS
January 5, 2005

SUPERVISORY PATENT EXAMINER
NADINE G. NORTON

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SUPERVISORY PATENT EXAMINER